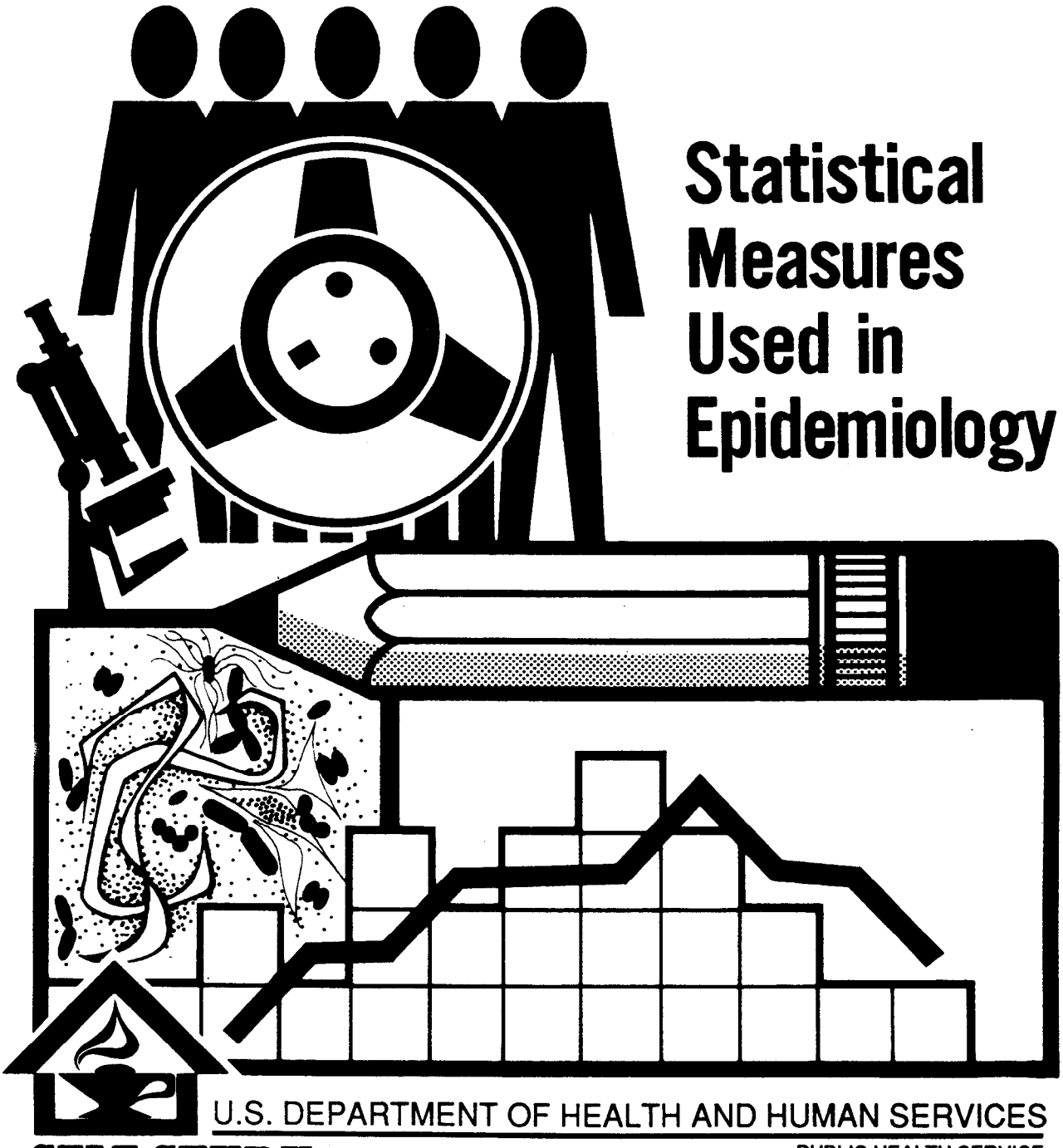
CDC

LESSON 3

SELF-STUDY COURSE 3030-G

Principles of Epidemiology



Statistical Measures Used in Epidemiology

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

SELF-STUDY

PUBLIC HEALTH SERVICE
Centers for Disease Control
Training and Laboratory Program Office
Division of Training
Atlanta, Georgia 30333

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PRINCIPLES OF EPIDEMIOLOGY

Self-Study Course 3030-G

LESSON 3: STATISTICAL MEASURES USED IN EPIDEMIOLOGY

Rates, Ratios, and Proportions

I: LESSON CONSISTS OF:

Part I: 33 multiple choice questions

II: PRIMARY REFERENCE:

Manual 3 - "Statistical Measures Used in Epidemiology"

NOTE: This manual is provided by CDC and should be included when you receive this lesson.

III: TOPICS AND READING ASSIGNMENTS:

Lesson 3

Objectives

Upon successful completion of Lesson 3, the student should be able to correctly:

- Identify, differentiate between, and recognize the characteristics of the statistical measures used in epidemiology (incidence rate, attack rate, proportional distribution, mortality rate, ratio).

- Specify which of the five measures above is most appropriate when given a situation with data for analysis, and demonstrate competency in performing the appropriate calculations by first identifying the numerator and denominator, with appropriate interpretation of the resulting figures.

PRINCIPLES OF EPIDEMIOLOGY

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LESSON 3: STATISTICAL MEASURES USED IN EPIDEMIOLOGY
Rates, Ratios, and Proportions

Part I: Multiple Choice

Rates, ratios, and proportions utilize the same basic form $\frac{x}{y} \times (k)$.

1. Which of the following is (are) correct regarding "x" as used for calculating morbidity and mortality rates?

   A. "x" is the number of cases of a particular disease.
   B. "x" is the "at risk" group.
   C. "x" is the number of deaths due to a particular cause.
   D. A and C above are true statements.

2. For morbidity and mortality rates "y" represents:

   A. The number of events.
   B. A variable of "k".
   C. A component of "x".
   D. The population "at risk."

3. Which of the following is (are) an example of "y" when used in calculating incidence rates?

   A. The total population of a community
   B. The number of persons exposed to measles in a school population
   C. The number of persons who ate the turkey salad
   D. All of the above

4. The "k" value in rates allows comparison of data between populations of different magnitudes, but the intent of using a <u>particular</u> "k" value in calculating rates is to obtain an answer that is a:

   A. Percentage.
   B. Range of data.
   C. Number close to 100.
   D. Small whole number.

5. To obtain a rate expressed as percent, the value of "k" must be:

   A. 1.
   B. 100.
   C. 1,000.
   D. 10,000.

6. To obtain a rate expressed "per 1,000 population", the value of "k" must be:

   A. 100.
   B. 1,000.
   C. 10,000.
   D. 100,000.

7. Rates are calculated by:

   A. Dividing "y" into "x" and then multiplying by "k".
   B. Dividing "x" into "y" and then multiplying by "k".
   C. Dividing "x" into "k," and then multiplying by "y".
   D. Multiplying "y" by "k."

8. Incidence rates are often confused with prevalence rates. They are similar, but the difference is important. Which one of the following statements is NOT correct?

   A. Both are types of morbidity rates.
   B. The numerator of a prevalence rate includes all persons ill from a specified cause during a specified interval or at a particular point in time.
   C. A prevalence rate does not include illness which began prior to the specified interval or point studied.
   D. An incidence rate is a measure of the frequency of occurrence of new cases of a disease within a defined population during a specified interval.

9. An incidence rate that is usually expressed as a percent, used for particular populations, and observed for limited periods of time, as in an epidemic, is known as:

   A. Prevalence rate.
   B. Adjusted rate.
   C. Index.
   D. Attack rate.

10. Which of the following expresses the ratio of 120 males to 60 females?

   A. 60:120
   B. 2:1
   C. 50%
   D. 66%

11. In the investigation of an epidemic, the rate that should be used to describe the frequency of occurrence of illness in the population at risk is called the:

   A. Proportional distribution.
   B. Prevalence rate.
   C. Attack rate.
   D. Case fatality rate.

Use the information below to answer questions 12 through 14.

Twenty-six new cases of tuberculosis were diagnosed in the city of Alpha between January 1 and June 30, 1983. There were a total of 264 cases on the list of active cases on that same date (June 30). The population of the city as of March 30 of that year was 183,000.

12. What is the incidence rate per 100,000 population of new cases of tuberculosis during that period?

    A. 7.6 per 100,000 population
    B. 14.2 per 100,000 population
    C. 27.3 per 100,000 population
    D. 78.7 per 100,000 population

13. What is the percent of cases active on June 30 that were added to the list during the first one half of the year?

    A. 9.0%
    B. 9.8%
    C. 10.9%
    D. 17.9%

14. The prevalence rate of active tuberculosis per 100,000 population on June 30, 1983, was:

    A. 14.2 cases/100,000
    B. 144.3 cases/100,000
    C. 290.0 cases/100,000
    D. 310.1 cases/100,000

Use the following information for questions 15, 16, and 17.

During 1982, 23 cases of tularemia occurred in a county with a population of 6,500 persons. The distribution of the tularemia cases in questions 15, 16, and 17 during the calendar year was: first quarter, 2; second quarter, 1; third quarter, 4; and the fourth quarter, 16.

15. What was the incidence of tularemia per 100,000 persons in that county during that year?

    A. 3.5
    B. 35.4
    C. 282.6
    D. 353.8

16. What was the incidence per 10,000 population during the second quarter?

    A. 0.92
    B. 1.5
    C. 6.2
    D. 150.0

17. What was the incidence per 10,000 population during the fourth quarter?

A. 1.50
B. 2.46
C. 9.20
D. 24.60

Use the following information to answer questions 18-21.

During the 2nd week of February, 87 persons in a small community (pop. = 460) attended a social event which included a meal prepared by several of the participants. Within 3 days, 39 of the participants became ill with a condition diagnosed as salmonellosis.

18. The attack rate in the participants was:

A. 4.5/100
B. 8.5/100
C. 44.8/100
D. 0.9/1000

19. Of the 39 males present, 29 became ill. What was the attack rate in males?

A. 7.4/100
B. 33.3/100
C. 44.8/100
D. 74.4/100

20. What was the attack rate in females?

A. 2.1/100
B. 11.5/100
C. 20.8/100
D. 55.2/100

21. Fifty-seven of the participants, of whom 33 became ill, were over 60 years of age. Calculate the attack rate in this age group.

A. 3.8%
B. 57.9%
C. 65.5%
D. 36.7/100

Use the following information to answer questions 22-24. Each question requires the calculation of a mortality rate (deaths per 100,000 population) for a specified age group.

Age Group (Years)	Number of Deaths	Population
< 1	5	10,450
1 – 19	9	159,650
20 – 39	20	120,800
40 – 59	36	95,750
60+	99	63,350
TOTAL	169	450,000

22. Age group: under 1 year:

A. 1.1
B. 3.8
C. 37.6
D. 47.8

23. Age group: 60+:

A. 15.6
B. 22.0
C. 58.6
D. 156.3

24. Age group: 20-39 years:

A. 4.4
B. 16.6
C. 44.0
D. 118.3

Calculate the ratios specified, using the preferred method (i.e., the smallest number in the ratio is 1.0) for questions 25-28.

25. Death-to-case ratio: 137 cases of meningococcal meningitis, 9 of which died:

A. 0.6:1
B. 1:1.5
C. 1:15.2
D. 1:16.2

26. Male-to-female ratio. Thirteen female and 32 male cases of hepatitis-B in the 15-24 year age group:

A. 1:2.5
B. 1:3.5
C. 1.4:1
D. 2.5:1

27. Ratio of the cases of hepatitis per 10,000 population in the 25-29 year age group (32.1) to that in the 10-14 age group (11.3):

A. 1:28
B. 1.9:1
C. 2.8:1
D. 3.5:1

28. Ratio of the cases of rubella per 100,000 in the 1-4 year age group (215.1) to that in the 5-9 year age group (117.1):

A. 0.2:1
B. 1.5:1
C. 1.8:1
D. 2.2:1

Use the following table to answer questions 29-33:

Col. #1 Age, years	Col. #2 Number of Cases	Col. #3 Population	Col. #4	Col. #5
1 less than 5 years	3	48	14.3	6.3
5–19	6	17	28.6	35.3
20–39	5	23	23.8	21.7
40+	7	109	33.3	6.4
TOTAL	21	197		

29. The figures in column #4 in this table comprise:

A. A proportional distribution of the population by age.
B. Attack rates by age.
C. A proportional distribution of cases by age.
D. Incidences by age.

30. The figures in column #5 in this table comprise:

    A. A proportional distribution of the population by age.
    B. Attack rates by age.
    C. A proportional distribution of cases by age.
    D. None of the above.

31. Use the information in column #3 to calculate the ratio of population in the 20-39 year age group to the population in the 5-19 year age group. The interpretation of this ratio is that:

    A. The population in the 20-39 year age group is 1.4 times greater than the population in the 5-19 year age group.
    B. The populations in the two age groups are the same.
    C. The population in the 5-19 year age group is 1.4 times greater than the population in the 20-39 age group.
    D. The attack rate is 1.4 times greater in the older age group.

32. Use the information in column #4 to calculate the ratio of the 20-39 year age group to the 5-19 year age group. The interpretation of this ratio is that:

    A. The attack rate in the older age group is eight tenths of the attack rate in the younger age group.
    B. There are eight tenths as many cases in the older group as there are in the younger group.
    C. There are eight tenths as many cases in the younger group as there are in the older group.
    D. The attack rate in the younger group is eight tenths that of the older group.

33. Use the information in column #5 to calculate the ratio of the events in the 5-19 year age group to the 20-39 year age group. The interpretation of this ratio is that:

    A. The attack rate in the older age group is 1.6 times the attack rate in the younger age group.
    B. There are 1.6 times as many cases in the older group as there are in the younger group.
    C. There are 1.6 times as many cases in the younger group as there are in the older group.
    D. The attack rate in the younger group is 1.6 times that of the older group.

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